NOT FOR PUBLICATION

UNITED STATES DISTRICT COURT
DISTRICT OF NEW JERSEY

MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD., Plaintiff, v. SAMSUNG ELECTRONICS CO., LTD., *et al.*, Defendants.	Civ. No. 02-336 (GEB) **OPINION**
SAMSUNG ELECTRONICS CO., LTD., *et al.*, Counterclaimants, v. MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD., Counterclaim Defendant.	

BROWN, C.J.:

This matter comes before the Court upon Plaintiff/Counterclaim Defendant Matsushita Electric Industrial ("MEI") and Defendants/Counterclaimants Samsung Electronics Co., Ltd. and its affiliates' (collectively referred to as "Samsung") motions for summary judgment pursuant to Federal Rule of Civil Procedure 56. This Court has jurisdiction pursuant to 28 U.S.C. §§ 1331 and 1338. For the reasons set forth below, the Court grants-in-part and denies-in-part both motions.

I. BACKGROUND

This is a patent infringement involving four patents generally relating to semiconductor

memory devices.[1] On January 25, 2002, MEI filed suit against Samsung alleging infringement of three of its patents, namely U.S. Patent No. 5,053,998 ("the '998 Patent"), U.S. Patent No. 5,375,095 ("the '095 Patent), and U.S. Patent No. 5,475,648 ("the '648 Patent"). On October 21, 2002, Samsung filed its Answer denying allegations of patent infringement and asserted counterclaims that MEI infringed its patent, namely U.S. Patent No. 5,751,048 ("the '048 Patent").

The parties moved for claim construction on March 8, 2006.[2] After the claim construction issues were fully briefed, the parties presented a live tutorial on the relevant technology. The Court then conducted a *Markman* hearing on February 2 and 3, 2006, and rendered its *Markman* decision on March 10, 2006. On April 17, 2006, the parties filed the instant motions for summary judgment.

MEI moves for summary judgment on three issues: 1) that Samsung's '048 Patent is invalid because it is anticipated by prior art; 2) that Samsung's DRAM devices literally infringe the '998 Patent; and 3) Samsung's devices infringe the '095 Patent.[3] Samsung moves for summary judgment on four issues: 1) that MEI's '095 Patent is invalid based on anticipation and/or obviousness; 2) MEI's '998 Patent is invalid based on anticipation; 3) its products do not infringe the '648 Patent; and 4) MEI's 0.25μM eDRAM products infringe Samsung's '048 Patent. Samsung also filed a motion to strike the certification of MEI's expert, Dr. Wendell Noble, which was submitted with

---

[1] For a detailed description of the general technology at issue in this case, see pages 4 and 5 of this Court's March 10, 2006 *Markman* Opinion.

[2] On December 6, 2005, the case was transferred from the Newark vicinage to the Trenton vicinage.

[3] MEI initially moved for summary judgment that MEI's 0.13 μM HPCMOS devices do not infringe Claims 1 and 2 of the '048 Patent. On May 15, 2006, the parties stipulated that Samsung would not assert that any of MEI's 0.13μm HPCMOS infringe the '048 Patent. (*See* May 15, 2006 Stipulation & Order Limiting Scope of Counterclaim). Thus, MEI's motion on this issue is moot and need not be addressed by the Court.

MEI's reply brief, and the portion of the reply brief to which the certification referred. The Court heard oral argument on the motions for summary judgment on May 15, 2006.

II. LEGAL STANDARDS

A. Summary Judgment Standard

As in all other cases, patent cases are amenable to summary judgment. *Barmag Barmer Maschinenfabrik AG v. Murata Machinery, Ltd.*, 731 F.2d 831 (Fed. Cir. 1984). A party seeking summary judgment must "show that there is no genuine issue as to any material fact and that the moving party is entitled to a judgment as a matter of law." FED. R. CIV. P. 56(c); *see also Celotex Corp. v. Catrett*, 477 U.S. 317, 322 (1986); *Orson, Inc. v. Miramax Film Corp.*, 79 F.3d 1358, 1366 (3d Cir. 1996); *Healy v. New York Life Ins. Co.*, 860 F.2d 1209, 1219, n.3 (3d Cir. 1988), *cert. denied*, 490 U.S. 1098 (1989); *Hersh v. Allen Prod. Co.*, 789 F.2d 230, 232 (3d Cir. 1986). The threshold inquiry is whether there are "any genuine factual issues that properly can be resolved only by a finder of fact because they may reasonably be resolved in favor of either party." *Anderson v. Liberty Lobby, Inc*., 477 U.S. 242, 250 (1986) (noting that no issue for trial exists unless there is sufficient evidence favoring the nonmoving party for a jury to return a verdict in its favor). In deciding whether triable issues of fact exist, the court must view the underlying facts and draw all reasonable inferences in favor of the nonmoving party. *Matsushita Elec. Indus. Co., Ltd. v. Zenith Radio Corp.*, 475 U.S. 574, 587 (1986); *Pa. Coal Ass'n v. Babbitt*, 63 F.3d 231, 236 (3d Cir. 1995); *Hancock Indus. v. Schaeffer*, 811 F.2d 225, 231 (3d Cir. 1987).

A movant must be awarded summary judgment on all properly supported issues identified in its motion, except those for which the nonmoving party has provided evidence to show that a

question of material fact remains. *See Celotex,* 477 U.S. at 324. Put another way, once the moving party has properly supported its showing of no triable issue of fact and of an entitlement to judgment as a matter of law, for example, with affidavits, which may be "supplemented . . . by depositions, answers to interrogatories, or further affidavits," *id.* at 322, "its opponent must do more than simply show that there is some metaphysical doubt as to the material facts." *Matsushita*, 475 U.S. at 586. The nonmoving party must "go beyond the pleadings and by [its] own affidavits, or by the 'depositions, answers to interrogatories, and admissions on file,' designate 'specific facts showing that there is a genuine issue for trial.'" *Celotex*, 477 U.S. at 324.

B. Patent Infringement

Patent infringement analysis entails a two-step process. *Research Plastics, Inc. v. Fed. Packaging Corp.*, 421 F.3d 1290, 1295 (Fed. Cir. 2005). The first step, claim construction, involves the determination of the scope and meaning of the patent claims. *Id.* Claim construction is a matter of law. *Markman v. Westview Instruments, Inc.,* 52 F.3d 967, 970-71 (Fed. Cir. 1995) (*en banc*), *aff'd*, 517 U.S. 370 (1996). Second, the allegedly infringing device must be compared against the properly construed claim. *Research Plastics*, 421 F.3d at 1295. In order to succeed on a claim of literal infringement, the patentee must prove by a preponderance of evidence that an accused device contains "each and every limitation set forth in a claim." *Frank's Casing Crew*, 389 F.3d at 1378. This step requires a factual determination. *Id.* This Court has already construed the disputed claim terms identified by the parties in its *Markman* Opinion and Order. The Court must now determine whether the accused products infringe the asserted claims.

C. Invalidity – Anticipation Under § 102(b)

Section 102 of the Patent Act provides that a person is entitled to a patent unless the invention was "described in a printed publication in this or a foreign country . . . more than one year prior to the date of the application for patent in the United States." 35 U.S.C. § 102(b). A finding of invalidity based on anticipation under 35 U.S.C. § 102 requires a determination that "each and every limitation is found either expressly or inherently in a single prior art reference." *PIN/NIP, Inc. v. Platte Chem. Co.*, 304 F.3d 1235, 1243 (Fed. Cir. 2002) (quoting *Celeritas Techs., Ltd. v. Rockwell Int'l Corp.*, 150 F.3d 1354, 1360 (Fed. Cir. 1998)). Because a patent that was issued by the Patent and Trademark Office ("PTO") enjoys a presumption of validity, the evidence supporting such a finding must be clear and convincing. *Id.* Whether a patent is anticipated by a prior art reference is a question of fact. *Schumer*, 308 F.3d at 1315.

III. DISCUSSION

A. MEI's Motion for Summary Judgment

1. Validity of the '048 Patent

As discussed in this Court's *Markman* Opinion, the '048 Patent generally claims a semiconductor device with a self-aligned contact window which is formed by "the sequential formation of a gate insulating layer, a polycrystalline silicon layer, a tungsten silicide layer, and a first insulating layer on a semiconductor substrate." '048 Patent, col. 2, ll. 48-51. The patent also explains that the layers are sequentially dry etched, "thereby forming the gates out of said first and second conductive layers and, at the same time, opening a contact window to an associated source and drain." '048 Patent, col. 2, ll. 53-56. This process, which allows the tungsten silicide layer to

be etched considerably faster than the other layers, causes the formation of an undercut region of the layer – or the "recessed edge portion." The "recessed edge portion" increases the reliability of the device by protecting the corners of the gates from exposure.

MEI asserts two claims against Samsung. Claims 1 and 2 of the '048 Patent recite:

> 1. A semiconductor device with a gate structure, said semiconductor device comprising:
>
> a gate insulating layer formed on a semiconductor substrate;
>
> a gate structure having a first conductive layer of polycrystalline silicon and a second conductive layer of refractory metal silicide, said first conductive layer being formed on said gate insulating layer and said second conductive layer being formed on said first conductive layer, said second conductive layer having a recessed edge portion with respect to an edge portion of said first conductive layer; and
>
> a first insulating layer formed on a top surface of said second conductive layer and having a protrusion portion with respect to an edge of said second conductive layer.
>
> 2. A semiconductor device according to claim 1, further comprising a source region and a drain region adjacent to said gate structure, and a second insulating layer formed on at least part of said first insulating layer, on said edge portion of said recessed second conductive layer and on said edge portions of said first conductive layer and said first insulating layer.

'048 Patent, Claims 1 & 2.

In support of its invalidity argument, MEI relies on two prior art references which allegedly render Claims 1 and 2 of the '048 Patent anticipated under § 102(b). These references are Japanese Laid-Open Patent Publication No. Sho 63/1988-10572 ("the NEC Publication") and Japanese Laid-Open Patent Publication No. Hei 2/1990-54960 ("the Sony Publication"). The Court will discuss each reference in turn.

a. The NEC Publication

The NEC Publication was published on January 18, 1988. MEI asserts that the '048 Patent's critical date for § 102(b) purposes is November 23, 1992.[4] Thus, according to MEI, the NEC Publication qualifies as anticipatory prior art not cited by the applicants during the prosecution of the patent. Regarding Claim 1, MEI asserts that the publication discloses the same semiconductor device as the claimed device. With regard to dependent Claim 2, MEI argues that the NEC Publication expressly discloses the "source" and "drain" regions, and inherently discloses the "second insulating layer" element. In support of this position, MEI relies on the expert opinion of Noble and the deposition testimony of Mr. Yong Hee Lee ("Lee"), the first named inventor of the '048 Patent.

Samsung argues that the NEC Publication cannot invalidate Claims 1 and 2 of the '048 Patent by anticipation because it is not enabling. Citing *Helifix Ltd. v. Blok-Lok, Ltd.*, 208 F.3d 1339 (Fed. Cir. 2000), Samsung asserts that MEI bears the burden of proving that the NEC Publication enables a person of ordinary skill in the art to practice the claimed invention without undue experimentation. Samsung contends that MEI submitted no evidence to support this burden. Additionally, Samsung argues that the evidence of record supports its position that the NEC Publication is not enabling. Relying on the Lee certification, Samsung argues that the publication is not enabling because the methods described in the reference cannot be used to create the claimed "recessed edge portion" of the '048 Patent without undue experimentation. (Lee Certification ¶¶ 6-

[4] The '048 Patent application was filed on November 3, 1995. This was a divisional application of Ser. No. 08/155,745 which ultimately issued as U.S. Patent No. 5,491,100. The filing date of the parent application is November 23, 1993. One year prior to this date is November 23, 1992.

21).

In response, MEI first argues that contrary to Samsung's assertion, MEI does not have the burden of proving enablement because "the NEC Publication itself provides enough detail to form the device shown in figure 1(d) [of the publication], which is identical to the '048 device." (MEI Reply at 26). MEI also submits the supplemental certification of Nobel who opines that a skilled artisan in 1992 could have used one of the etching methods disclosed in the NEC Publication in combination with her own knowledge to make the claimed device. (Noble Supp. Cert. ¶ 8).

The Court will address a preliminary issue disputed by the parties – namely, who bears the burden concerning enablement. Notably, both parties rely on *Amgen Inc. v. Hoechst Marion Roussel, Inc*., 314 F.3d 1313, 1355 (Fed. Cir. 2003) in support of their contradicting positions. In *Amgen*, the Federal Circuit held that "a presumption arises that both the claimed and unclaimed disclosures in a prior art patent are enabled." *Id.* The court explained that during patent prosecution, an examiner can reject an application claim on the basis that the claim is anticipated by a prior art patent without having to conduct an inquiry into whether that prior art patent is enabled. *Id.* Thus, the examiner applies a presumption of enablement. *Id.* A patent applicant, however, is entitled to rebut this presumption by proving that the disclosures in the prior art patent are not enabled. *Id.* The court reasoned that an accused infringer in a patent litigation, who asserts a prior art patent against a patentee in support of an anticipation claim, should likewise be entitled to this presumption of enablement. *Id.*

The court did not decide, however, whether the presumption applies to non-patent publications. *See id.* at 1355 n.22. Specifically in a footnote, the court left that issue unresolved: "We note that by logical extension, our reasoning here might also apply to prior art printed

publications as well, but as Sugimoto is a patent we need not and do not so decide today." *Id*. MEI relies on this footnote and argues that the Court should adopt that "logical extension" and find that, as a matter of law, non-patent publications are presumed enabled. Samsung asserts that MEI is asking for an unwarranted extension of the law by applying *Amgen*'s reasoning to non-patent publications.

The Court agrees with Samsung. An accused infringer attempting to invalidate a patent by anticipation bears the burden of proving by clear and convincing evidence "that the four corners of a single, prior art document describe every element of the claimed invention." *Advanced Display Sys., Inc. v. Kent State Univ.*, 212 F.3d 1272, 1282 (Fed. Cir. 2000). This burden includes the ability to show that the reference is enabling. *Id; see also Amgen*, 314 F.3d 1354 ("A claimed invention cannot be anticipated by a prior art reference if the allegedly anticipatory disclosures cited as prior art are not enabled."). The Federal Circuit in *Amgen* carved an exception when the reference is a prior art patent. The court, however, declined to apply that presumption to foreign publications, such as the NEC Publication. Without further guidance by the Federal Circuit, and in light of the accused infringer's heavy burden with regard to invalidity, the Court declines to shift the burden of proving nonenablement to Samsung, the patentee.

Based on this conclusion, the Court finds that Samsung adduced sufficient evidence in its opposition to create a genuine issue of material fact as to whether the NEC Publication is enabled.[5]

---

[5] MEI urges the Court to ignore Lee's testimony. In support of this request, MEI cites a case wherein the Federal Circuit stated that inventor testimony has little probative value in the context of a claim construction analysis. (MEI Reply at 27 (citing *E-Pass Techs., Inc. v. 3Com Corp.*, 343 F.3d 1364, 1370 (Fed. Cir. 2003)). The Court finds MEI's position unpersuasive since Lee's testimony is not in support of a claim construction argument, but rather an invalidity argument.

Consequently, the Court denies MEI's motion for summary judgment that the NEC Publication anticipates Claims 1 and 2 of the '048 Patent.[6] [7]

b. The Sony Publication

MEI moves for summary judgment that the Sony Publication anticipates the '048 Patent by disclosing each and every limitation of Claims 1 and 2. This publication was published on February 23, 1990, i.e., more than one year prior to the critical date of the'048 Patent application. It describes two semiconductor devices which, according to MEI, include the same five layers required by the '048 Patent claims. MEI asserts that Figures 2b and 3 of the Sony reference show the presence of all claimed elements.

In its opposition brief, Samsung contends that MEI fails to meet its burden. In particular, Samsung argues that the figures in the Sony Publication do not disclose a "recessed edge portion" because "the lowest part of the tungsten silicide layer is continuous with the upper most part of the

---

[6] Samsung filed a separate motion to strike the supplemental certification of Noble and pages 24 to 30 of MEI's reply brief on the grounds that MEI should have introduced this evidence in their moving brief since they are the party with the burden of proving enablement. In light of the Court's finding that the evidence Samsung adduced in its opposition creates a genuine issue of material fact and thus precludes entry of summary judgment in favor of MEI, the Court denies Samsung's motion to strike the Noble certification as moot.

[7] Samsung appears to suggest that this Court should not only deny summary judgment, but grant summary judgment in favor of Samsung, the nonmovant, based on the evidence of record. Samsung cites *Massey v. Del Laboratories, Inc.,* 118 F.3d 1568, 1572 (Fed. Cir. 1997) in support of this proposition. The Federal Circuit in *Massey* stated: "In many cases, where the factual record has been well developed before the summary judgment stage, the grant of summary judgment to the non-movant *may* well be the most efficient manner to decide a case." *Id.* (emphasis added). Based on the permissive language of that statement by the Federal Circuit, this Court is not obligated to follow Samsung's suggestion. Rather, in accordance with Federal Rule of Civil Procedure 56, the Court will grant summary in favor of a moving party when there are no genuine issues of material fact which must be decided at trial.

polysilicon layer," i.e., no indentation separates the edges of the two layers. (Samsung Opp'n at 11). Samsung contends that MEI acknowledged this during the claim construction process when it argued that the claim would cover "a structure where the recess of the sidewall is not throughout its height but involves at least a recess of the critical edge portion of the sidewall of the second conductive layer." (MEI Br. in Supp. of its Claim Construction of the Samsung Patent at 14). Notably, MEI pointed to a figure that is virtually identical to Figure 2b of the Sony Publication when it made this statement. Additionally, Samsung submits the opinions of Dr. Frederick Streiter, Samsung's claim construction expert, and Lee, the '048 Patent inventor, in support of its position that the "recessed edge portion" is not found in this prior art reference. In response to this argument, MEI asserts that even if the figures fail to show a fully "recessed edge portion," the Sony reference "teaches additional etching to further enlarge the recess." (Certification of Jack Q. Lever ("Lever Cert.") at 13).

The Court is not persuaded by MEI's arguments. Based on the record evidence, the Court agrees with Samsung that MEI fails to proffer clear and convincing evidence that each and every element of the '048 Patent is found in the Sony Publication. The Court concluded in its *Markman* decision that "recessed edge portion" requires the edge of the second conductive layer to be indented in its entirety. (*Markman* Order at 3). Here, the figures in the Sony Publication do not clearly disclose this. Instead, the figures appear to depict a second conductive layer with only a portion of its edge indented with respect to the first conductive layer. However, the Court finds that conclusions regarding these figures cannot be made as a matter of law as they involve subjective interpretations that must be made by the factfinder. Accordingly, the Court denies MEI's motion for summary judgment because there are genuine factual issues concerning whether the figures of the

Sony Publication disclose each and every limitation of Claims 1 and 2 of the '048 Patent.

2. Infringement of the '998 Patent

MEI moves for summary judgment that Samsung's DRAM devices literally infringe Claims 1, 2, 4, 5, 7 and 8 of the '998 Patent. The accused products include Samsung's numerous commodity and embedded DRAM devices which can be grouped into seven categories. The commodity DRAM devices include Types 1, 2, 3, 5, 6, and the embedded DRAM devices include Types A and B. In particular, MEI seeks summary judgment that Types 5, 6 and B infringe Claims 1, 2, 4, and 5. MEI also seeks summary judgment that all types of Samsung's devices infringe Claims 7 and 8. (Tr. of Oral Arg. at 43:2-10).

In opposition, Samsung advances the following arguments: 1) the accused products do not give a "time difference" as required by the "delay means" limitation; 2) the accused products do not have sense amplifier drivers at "opposite ends" of the signal lines as required by the claims; and 3) the accused products do not practice the "restore/drive signal lines" limitations.[8]

a. "*delay means*"

i. Independent Claims 1, 4 and 7

Samsung's first argument relates to the claim limitation "delay means" which appears as a

[8] MEI asks this Court, in the alternative, to grant partial summary judgment of infringement pursuant to Federal Rule of Civil Procedure 56(d) should the Court conclude that genuine issues of fact exist with respect some claim elements. (MEI Br. at 34). Notably, Samsung limits its opposition to these particular claim elements. Thus, to the extent MEI provided sufficient evidence establishing the existence of the remaining limitations in the accused products, the Court will grant summary judgment since no triable issues of fact remain as to those claim limitations. *Celotex,* 477 U.S. at 324.

claim limitation in all of the asserted claims. Because Samsung advances an additional argument with respect to this claim limitation for dependent Claims 2, 5, and 8, the Court will first analyze the asserted independent claims of the '998 Patent. Claims 1, 4 and 7 recite:

> 1. A semiconductor memory device comprising:
>
> a memory cell array having a plurality of memory cells arranged in the form of a matrix;
>
> a means for reading into a plurality of data lines data from a plurality of memory cells connected to a specific word line by activating said specific word line of said memory cell array;
>
> a sense amplifier consisting of a plurality of differential amplifiers connected to said plurality of data lines respectively for amplifying the data read into said plurality of data lines;
>
> first and second sense amplifier drivers connected to the opposite ends of a restore signal line and a drive signal line respectively which are in turn connected to said plurality of differential amplifiers of said sense amplifiers, and
>
> *a delay means for giving a time difference to an operation start timing of said first and second sense amplifier drivers.*
>
> 4. A semiconductor memory device comprising:
>
> a memory cell array having a plurality of memory cells arranged in the form of a matrix;
>
> a means for reading into a plurality of data lines data from a plurality of memory cells connected to a specific word line by activating said specific word line of said memory cell array;
>
> a first sense amplifier consisting of a plurality of differential amplifiers connected to a specific number of data lines of said plurality of data lines respectively for amplifying data read into said specific number of data lines;
>
> a second sense amplifier consisting of a plurality of differential amplifiers connected to remaining data lines of said plurality of data

> lines respectively for amplifying data read into said remaining data lines;
>
> first and second sense amplifier drivers connected to the opposite ends of the restore signal line and drive signal line which are in turn connected in common to the differential amplifiers of said first and second sense amplifiers;
>
> a third sense amplifier driver connected to said restore signal line and said drive signal line which are disposed between said first and second sense amplifiers, and
>
> *a delay means for giving a time difference to the starting operation timing of said first, second and third sense amplifier drivers.*
>
> 7. A semiconductor memory device comprising:
>
> a memory cell array having a plurality of memory cells arranged in the form of a matrix;
>
> a means for reading into a plurality of data lines data from said plurality of memory cells in said memory cell array;
>
> sense amplifiers consisting of a plurality of differential amplifiers for amplifying data read into said plurality of data lines;
>
> a plurality of sense amplifier drivers connected to a plurality of positions of the signal lines respectively which are in turn connected in common to said plurality of differential amplifiers, and
>
> *a means for giving a time difference to the operation starting timing of said plurality of sense amplifier drivers.*

'998 Patent, Claim 1, 4 & 7 (emphases added).

The parties agreed to the construction of this term. In particular, the parties agreed that the term is a means-plus-function limitation and the function is "for giving a time difference to an operation start timing of the first and second sense amplifier drivers." (Joint Claim Construction

Chart at 3).[9] In the instant motion, well past the claim construction stage, the parties dispute the meaning of the word "giving" in their stipulated claim construction. Samsung argues that some affirmative step must be taken by the manufacturer, such as adjusting wiring resistances or implementing delay-causing circuitry, in order to perform this function. (Samsung Opp'n at 32-33). According to Samsung, simply connecting two wires together and relying on the wires' intrinsic properties to cause the delay is insufficient to meet this claim limitation. Samsung asserts that this type of situation (which the parties describe as "inherent delay") does not read on the "delay means" limitation.

MEI responds by arguing that Samsung is merely raising a belated claim construction argument for a term to which the parties already stipulated. This Court agrees. Although Samsung asserts otherwise, (Tr. of Oral Arg. at 45:6-11), Samsung is essentially requesting that this Court adopt a more narrow claim construction than the one jointly agreed to by the parties. The Court declines to adopt a narrow claim construction, not only because of Samsung's failure to advance this argument during the claim construction process, but because the Court finds nothing in the claim language itself or in the ordinary meaning of the word "giving" to support the conclusion that some affirmative step must be taken.

Additionally, certain claims of the patent belie Samsung's argument that the claims cannot cover inherent delay. For example, dependent Claim 2 recites that the delay means is "constituted by the wiring resistances and parasitic capacitance of the drive signal lines." '048 Patent, Claim 2.

---

[9] The parties also stipulated that the corresponding structure is "the signal lines, with wiring resistances designated as R2 and R3 and associated parasitic capacitance, adapted to actuate the first and second sense amplifier drivers, either alone or in combination with inverter circuits." (*Id.*).

Thus, if this Court were to accept Samsung's argument, the claimed subject matter of dependent Claim 2 would fall outside the scope of the claim from which it depends. Clearly this cannot be the case. Consequently, the Court rejects this argument.[10]

Turning to the evidence of record, MEI relies on the certification of its expert, David Taylor ("Taylor"). Taylor opines that a time difference is achieved "[b]y virtue of the parasitic capacitance and resistances of the LAPG and LANG lines" in all types of the Samsung DRAM devices. (MEI's Br. at 49 (citing Hwang 3/22/06 Dep. at 193-94, 238-40)).

Samsung's rebuttal, however, is wholly premised on the inaccurate assumption that inherent delay fails to satisfy this claim limitation. (Samsung Opp'n at 32-33 & n.80 (arguing that MEI failed to submit evidence establishing that Samsung took affirmative steps to "give" delay such as by adjusting wiring resistances or adding circuitry)). Having already rejected this argument that the inherent delay of the wires is insufficient to meet this claim limitation, and having failed to offer evidence of its own that would create a triable issue of fact, the Court concludes that summary judgment should be granted in favor of MEI as to the "delay means" limitation with respect to independent Claims 1, 4 and 7.

ii. Dependent Claims 2, 5 and 8

Samsung further contends that the accused products do not infringe dependent Claims 2, 5 and 8 for two reasons. Samsung's first argument, i.e., that inherent delay is insufficient to satisfy

---

[10] Samsung urges the Court to follow the proceedings and outcome of the Japanese Patent Office ("JPO"). Because this Court is not fully apprised of the details concerning this foreign proceeding, the Court places the greatest amount of evidentiary weight to the evidence of record in this case and will attribute minimal, if any, evidentiary weight to the Japanese proceedings. *See e.g., Medtronic Inc. v. Daig Corp.*, 789 F.2d 903, 907-08.

the "delay means" limitation, has already been rejected by this Court, and thus need not be repeated here.

Samsung's second argument, however, concerns the particular signal lines which make up the "delay means." Samsung argues that dependent Claims 2, 5 and 8 require the "delay" to be given by the restore and drive signal lines. In particular, Samsung notes that Claims 2 and 5 recite: "wherein said delay means is constituted by the wiring resistances and parasitic capacitance of *the drive signal lines* . . . ." '998 Patent. col. 6, ll. 16-18, 56-68 (emphasis added). Similarly, Claim 8 requires:

> 8. A semiconductor memory device as defined in claim 7, wherein said delay means is constituted by the wiring resistance and parasitic capacitance of *said signal lines*.

Id., col. 8, ll. 4-7 (emphasis added). Samsung notes that "said signal lines" in dependent Claim 8 refers to the "signal lines" recited in Claim 7 which the parties agreed are the "restore signal line" and "drive signal line." (Joint Claim Construction Chart at 8-9). As such, Samsung argues that summary judgment with respect to dependent Claims 2, 5 and 8 must be denied because MEI proffered no evidence that the restore and drive signal lines in the accused products constitute the "delay means."

MEI counters by asserting that the parties agreed that the signal lines to which dependent Claims 2, 5 and 8 refer are the "wire resistances designated as R2 and R3 and associated parasitic capacitance," and that there is no dispute that this corresponds to the LAPG and LANG lines in the accused products.

The Court finds Samsung's argument persuasive. Based on a plain reading of the dependent claims, Claims 2 and 5 necessarily include the drive signal lines as part of the "delay means," in

addition to the wiring resistances and associated parasitic capacitance of those lines. In its claim charts, however, MEI asserts that the "delay means" limitation is satisfied by the inherent delay of the LAPG and LAPN lines. (*See* MEI's Br. at 50, 54-55, 58). Notably, MEI differentiates the LA/LAB lines from the LAPG and LAPN lines – stating that the "LA line" in the accused devices corresponds to the "restore signal line" and the "LAB" line corresponds to the "drive signal line." (*Id.* at 42). In contrast, the LAPG and LANG lines are described as lines which provide "signals to turn on the sense amplifier drivers and are what the '998 Patent claims refer to as the delay means." (*Id.*). Based on these designations, it is unclear whether the accused devices read on the "delay means" limitation in dependent Claims 2 and 5.

Similarly, dependent Claim 8 provides that the "delay means" is made up of "the wiring resistance and parasitic capacitance of said signal lines." '998 Patent, Claim 8. Finding its antecedent basis in Claim 7, the "signal lines" of Claim 8 refer to the "signal lines" of Claim 7 which the parties stipulated means the "restore signal line" and the "drive signal line." (Joint Claim Construction Chart at 8). For the same reasons discussed above, the record is unclear whether the accused devices satisfy this particular claim limitation. Consequently, the Court concludes that genuine issues of fact exist as to whether the accused products read on the "delay means" limitation of dependent Claims 2, 5, and 8. Accordingly, summary judgment is denied as to these claims.

b. "*opposite ends*"

Samsung's second argument relates to the "opposite ends" claim limitation which is required by Claims 1, 2, 4 and 5. The Court construed "opposite ends" to mean "toward the termination point of the conductor lines." (*Markman* Order at 2). In support of its assertion that the accused products

have sense amplifier drivers at "opposite ends" of the signal lines, MEI relies on the certification of its expert, Taylor. In response, Samsung contends that this evidence is conclusory in nature and fails to satisfy MEI's evidentiary burden. Samsung further contends that the record evidence compels the opposite conclusion – i.e., that the sense amplifier drivers are not located at "opposite ends" of the signal lines.

Based on the evidence before the Court, particularly the parties' contradicting interpretations of the diagrams in the record which depict the positions of the sense amplifier drivers in the accused devices, the Court concludes that summary judgment as to this claim limitation is not warranted. Whether the sense amplifier drivers are located "toward the termination point[s] of the conductor lines" is a decision that must be decided by the factfinder at trial. Consequently, the Court denies MEI's motion for summary judgment that the accused devices satisfy the "opposite ends" limitation of Claims 1, 2, 4 and 5.

c. "*restore/drive signal lines*"

Samsung's next argument concerns the "restore/drive signal lines" limitation which is required by all asserted claims.[11] The Court construed "restore signal line" as "a line that is connected to both the sense amplifier driver and the differential amplifier through which an electric current, namely a restore signal, flows which causes the differential amplifiers to operate." (*Id.* at 2). The Court also construed "drive signal line" as "a line that is connected to both the sense

[11] As noted above although Claims 7 and 8 refer to "the signal lines" rather than the specific terms "restore signal line" and "drive signal line," the parties agreed that "the signal lines" refer to the "restore signal line" and the "drive signal line." (Joint Claim Construction Chart at 8).

amplifier driver and the differential amplifier through which an electric current, namely a drive signal, flows which causes the differential amplifiers to operate." (*Id.*). Samsung argues that MEI fails to adduce evidence demonstrating that electric current flowing through the signal lines is what causes the differential amplifiers to operate in the accused devices. Rather, Samsung asserts that the differential amplifiers in the accused devices "operate on voltage levels, independent of electric current." (Samsung Opp'n at 48). According to Samsung, when the transistor gates in its devices reach a certain voltage level, the gate operates independent of electric flow. Samsung relies on the opinion of its expert, Dr. Milton Gosney ("Gosney") in support of this position. (Gosney Decl. ¶ 14).

In response, MEI argues that the differential amplifiers in the accused devices are identical to the differential amplifiers described in the '998 Patent. Additionally, relying on the certification of its expert, Taylor, and a basic principle of electronic circuitry, namely voltage equals current multiplied by resistance (V=IR), current must flow if voltage flows. (Supp. Taylor Cert. ¶ 6).

In light of this evidence, the Court concludes that a genuine issue of material fact exists with respect to this claim limitation. Consequently, the Court denies this motion for summary judgment based on this conclusion regarding the "restore signal line" and "drive signal line" claim limitations of the '998 Patent.

d. "*sense amplifier driver*"

Samsung lastly argues that the Court should deny MEI's motion for summary judgment because MEI fails to establish that the accused devices meet the "sense amplifier driver" claim limitation. The Court concluded that "sense amplifier driver" means "a circuit that is connected to a restore signal line and a drive signal line which provides voltages for operating the differential

amplifiers." (*Markman* Order at 2). Claim 1 of the patent requires:

> first and second sense amplifier drivers connected to the opposite ends of a restore signal line and a drive signal line respectively which are in turn connected to said plurality of differential amplifiers of said sense amplifiers . . . .

'998 Patent, Claim 1. Samsung argues that this limitation is not satisfied because there are intermediate drivers that are located in the accused devices in between the first and second sense amplifier drivers. According to Samsung, these drivers may be the source of operating voltages and thus MEI has not proven that the "first and second sense amplifier drivers" limitation is met. (Gosney Decl. ¶ 17).

MEI contends that Samsung's argument is flawed. Relying on *A.B. Dick Co. v. Burroughs Corp*., 713 F.2d 700, 703 (Fed. Cir. 1983) and *Canon Computer Systems, Inc. v. Nu-Kote International, Inc.*, 134 F.3d 1085 (Fed. Cir. 1998), MEI cites the axiomatic principle that "one cannot avoid infringement merely by adding elements if each element in the claims is found in the accused device." As long as the first and second sense amplifier drivers in the accused devices provide operating voltages to the differential amplifiers, MEI asserts that it is irrelevant whether other intermediate drivers also provide operating voltages since the claim limitation has already been satisfied.

The Court agrees with MEI. Samsung fails to rebut MEI's evidence that the first and second sense amplifier drivers, or LA transistor and LAB transistor, provide the operating voltages to the differential amplifiers. (Lever Cert., Ex. 14 at 38-40, Exs. 20-26). Samsung only proffered the expert opinion of Gosney which merely stated that intermediate drivers may also provide voltages. The Court notes that Gosney did not opine that the intermediate drivers do not provide voltages to

the first and second drivers. This arguably would have created a genuine issue of fact. Consequently, the Court grants summary judgment that the accused devices satisfy the "sense amplifier drivers" limitation of Claim 1. Samsung offers a similar argument for Claims 4 and 5 which require two sense amplifiers and three sense amplifier drivers. For the reasons discussed above, the Court likewise rejects this argument.[12]

Accordingly, the Court concludes that numerous issues of fact preclude summary judgment that the accused devices literally infringe Claims 1, 2, 4, 5, 7 and 8 of the '998 Patent. In light of the Court's foregoing analysis, the Court denies summary judgment as to whether: 1) the accused devices satisfy the "delay means" limitation of dependent Claims 2, 5 and 8; 2) the accused devices satisfy the "opposite ends" limitation of Claims 1, 2, 4 and 5; and 3) the accused devices satisfy the "restore/drive signal line" limitations of all asserted claims. However, because the Court finds that MEI proffered sufficient evidence to establish the existence of the remaining limitations in the accused devices, the Court will grant summary judgment as to those limitations. (*See* MEI Br. at 46-58).

3. Infringement of the '095 Patent

MEI next moves for summary judgment that Samsung's DRAM devices infringe Claims 1 to 4, 6 and 7 of the '095 Patent. As discussed in greater detail in this Court's *Markman* Opinion, the '095 Patent relates to "power supply meshes extending throughout a memory array region in which

[12] Samsung also argues that MEI fails to demonstrate that a third sense amplifier driver is "disposed between" a first and second sense amplifier driver as required by Claims 4 and 5. This argument is unavailing. The exhibits depict Types 2, 3, 5, 6, A and B with a third sense amplifier driver situated or "disposed between" a first and second one.

are formed memory cells and sense amplifier circuits." '095 Patent, Abstract. Such an arrangement enables "sense amplifier drive circuits to be distributed throughout that memory array region, with each sense amplifier drive circuit being connected to the nearest points on the two supply meshes." *Id.* The claimed invention is directed toward improving read access time and increasing the total memory capacity. *Id.* In this motion, MEI asserts that each and every element of Claims 1 to 4, 6 and 7 are found in Samsung's DRAM devices. Samsung contends that the accused devices do not meet at least three claim limitations. The Court will address each limitation in turn.

a. "*electrically isolated*" voltage supply meshes

Claim 1 is the only independent claim of the '095 Patent. Claim 1 recites:

> 1. A semiconductor memory apparatus including a memory array region having formed therein:
>
> a plurality of unit memory cell blocks distributed through said memory array region at regular spacings, each formed of an array of memory cells;
>
> a plurality of unit sense amplifier blocks distributed among said unit memory cell blocks at regular spacings, each formed of an array of sense amplifier circuits;
>
> a plurality of sense amplifier drive circuits for driving said sense amplifier circuits, distributed among said unit sense amplifier blocks at regular spacings; and
>
> first and second voltage supply meshes, mutually *electrically isolated* and each extending throughout said memory array region, respectively coupled to receive first and second supply voltages;
>
> each of said sense amplifier drive circuits being coupled to an adjacent point on said first voltage supply mesh to receive said first supply voltage and to an adjacent point on said second voltage supply mesh to receive said second supply voltage.

'095 Patent, Claim 1 (emphasis added).

In support of its assertion that the accused devices satisfy this claim limitation, MEI relies on the deposition testimony of Mr. Hong Sun Hwang ("Hwang"), Samsung's corporate representative of DRAM devices, and the expert opinion of Taylor. (*See* Pl. Ex. 14, Hwang Dep. at 196-97 & Ex. 16 to Hwang Dep.; Taylor Cert. ¶¶ 72-73).

Samsung argues that MEI fails to establish that the accused devices contain voltage supply meshes that are "electrically isolated" from each other. Samsung submits evidence to support its position that the voltage supply meshes in the accused devices are actually electrically connected by capacitors. According to Samsung, this feature provides particular benefits to the DRAM device. Specifically, in the event that a "stray" voltage signal changes the voltage supply on one mesh, a stabilizing capacitor will "keep both meshes at a stable voltage relative to each other." (Samsung Opp'n at 57). Samsung relies on the deposition testimony of Hwang, as well as the expert opinion of Gosney, in support of this assertion. (*See* Pl. Ex. 14, Hwang Dep. at 195:9-199:12 & Exs. 30-33; Ex. 14, Gosney Decl. ¶¶ 18-25).

In light of the evidence adduced by Samsung, the Court concludes that a genuine issue of material fact exists with regard to the "electrically isolated" claim limitation which must be resolved at trial. Consequently, summary judgment is denied as to whether the accused devices meet the "electrically isolated" claim limitation

b. "*interconnected by through-hole connections in each of a plurality of connection regions*"

Claim 6, the claim from which asserted Claim 7 depends, claims:

> A semiconductor memory apparatus according to claim 1, in which said plurality of unit memory cell blocks are configured as a plurality of columns of unit memory cell blocks each extending in a first direction, each column consisting of a plurality of said unit memory cell blocks disposed at regular spacings, and in which each of said memory cells is connected to one of a plurality of word lines which extend in said first direction, each of said word lines being formed of an upper conductor formed in an upper layer of a substrate of said semiconductor memory apparatus and a lower conductor formed in a lower layer of said substrate, said *upper and lower conductors being interconnected by through-hole connections in each of a plurality of connection regions* provided at intervals throughout each of said columns.

'095 Patent, Claim 6 (emphasis added).

In support of its position that this claim limitation is present in the accused devices, MEI relies on the deposition testimony of Hwang. (MEI's Br. at 73-74). Hwang describes Samsung's DRAM devices as consisting of two layers, "poly 1" and "poly 2," through which sub wordlines referred to as "bit-line poly lines" and "gate poly lines" run. (Hwang Dep. at 115-16). The sub wordlines are interconnected at various points or "through-hole connections," which Samsung also refers to as "direct contacts." (*Id.* at 116). MEI asserts that these interconnections occur in connection regions along columns of the memory cell array, thereby satisfying this claim limitation.

Samsung contends that MEI fails to establish that the accused devices meet this claim limitation. Samsung argues that the accused devices fall outside the scope of Claim 6 because the devices use what is referred to as "split word line architecture" – a structure wherein "each sub-word line connects to and activates the access transistors of memory cell blocks." (Hwang Decl. ¶ 7; *see also* Gosney Decl. ¶¶ 32-34). Samsung maintains that the interconnections do not occur in multiple regions as required by the claim, but instead in a single region between cell blocks. As such, Samsung argues that summary judgment must be denied at least with respect to this claim limitation.

The Court concludes that Samsung has proffered sufficient evidence to create a genuine issue of fact for trial. For at least this reason, the Court must deny summary judgment as to whether the accused devices infringe Claim 6 of the '095 Patent.

c. "*part of the substrate*"

Lastly, Samsung argues that summary judgment must be denied because MEI fails to prove that Samsung's DRAMs satisfy the "upper layer of a substrate" and "lower layer of said substrate" limitations as required by Claims 2, 3, 6, and 7. In its claim construction analysis, the Court concluded that the claims cover a device which includes an upper and lower layer as part of its substrate. Specifically, an "upper layer of a substrate" was construed as "a layer, situated above a lower layer, which is part of the substrate." (*Markman* Order at 3). Similarly, "a lower layer of said substrate" was defined as "a layer, situated below an upper layer, which is part of the substrate." (*Id.*). Samsung now asserts that the evidence fails to demonstrate that the conductive layers of the semiconductor device are "part of the substrate." Samsung argues that the mesh and word line layers of the accused devices contain conductive layers that are situated above the substrate. According to Samsung, summary judgment must be denied because these layers have not been proven to be "part of the substrate."

In response, MEI argues that Samsung is essentially asking this Court to define the term "substrate" as a bare silicon wafer. In this Court's *Markman* Opinion, the Court noted that the specification of the '095 Patent suggested that the patentees intended the word lines, transistors, and other circuit elements to be part of the substrate. (*Markman* Op. at 35-40). The Court referenced Figure 5E of the patent, noting that there was no indication in the patent's disclosure "that the

substrate cannot encompass the area above and around the upper and lower layers, such that the layers will be part of the entire substrate." (*Id.* at 39-40). MEI agues that the structures of the accused devices are nearly identical to Figure 5E of the '095 Patent, and therefore clearly meet the requirement that the layers are "part of the substrate."

Based on the evidence before it, the Court finds the record unclear as to whether Samsung's devices meet this particular claim limitation. This is a disputed factual issue that must be decided by the factfinder at trial. Accordingly, summary judgment as to this claim limitation is denied.

In conclusion, the Court denies summary judgment as to whether the accused devices: 1) meet the "electrically isolated" claim limitation; 2) infringe Claim 6; and 3) satisfy the "part of the substrate" requirement. However, because the Court finds that MEI proffered sufficient evidence to establish the existence of the remaining limitations in the accused devices, the Court will grant summary judgment as to those limitations. (*See* MEI Br. at 66-74).

C. Samsung's Motion for Summary Judgment

1. Validity of the '095 Patent

a. Anticipation

i. The Hara Reference

Samsung moves for summary judgment that Claims 1 to 4 and 6 of the '095 Patent are invalid because they are anticipated by the Hara reference. The United States application for the '095 Patent was filed on June 12, 1991. The Hara reference was published on January 8, 1990. Thus, Samsung asserts that the Hara reference qualifies as prior art under 35 U.S.C. § 102. Samsung claims that the Hara reference discloses each and every limitation of the claims of the '095 Patent.

According to Samsung, the Hara reference uses different terms to described certain limitations. For example, the term "transfer gates" is used to describe "sense amplifier drivers," the term "voltage source lines" is used to describe "voltage supply meshes," and "differential amplifiers" are referred to as "bit line sense amplifiers."

In response, MEI argues that the Hara reference does not anticipate because it fails to disclose at least two claim limitations found in Claim 1. Specifically, MEI contends that the references does not disclose: 1) a "plurality of *sense amplifier drive circuits* for driving sense amplifier circuits, distributed among said unit sense amplifier blocks at regular spacings;" and 2) "first and second *voltage supply meshes*, mutually electrically isolated and each extending throughout said memory array region, respectively coupled to receive first and second supply voltage." (MEI Opp'n at 7).

With regard to the first claim limitation, MEI contends that Samsung incorrectly equates "transfer gates" with "sense amplifier drivers." MEI points to Samsung's own translation of the Hara references and the claim chart provided by Samsung. In these references, the term "transfer gates" is differentiated from "sense amplifier drivers." (*Id.* at 9 (citing Samsung's Br. at 13); Certification of Michael A. Oakes ("Oakes Cert."), Ex. '095-5 at D-0138468, D-1038471; Taylor Cert., Ex, 095-3). MEI's expert Taylor explains that "sense amplifier drivers" are "circuits which provide voltages for operating the sense amplifiers," whereas "transfer gates" as used in the Hara reference "are part of the bit line sense amplifiers and function to turn off selected groups of bit line sense amplifiers in order to conserve power." (Taylor Cert., Ex, 095-3 (citing Oakes Cert., Ex. '095-5).

Based on the evidence of record, the Court concludes that there is a genuine factual dispute as to whether the Hara reference discloses this particular limitation. This precludes entry of

summary judgment that the Hara reference anticipates, and thus invalidates, independent Claim 1 of the '095 Patent. In light of this conclusion, summary judgment must also be denied with respect to the remaining dependent claims.

Additionally, MEI contends that there is an issue of fact as to whether the Hara reference discloses "voltage supply meshes." Samsung asserts that the Hara reference discloses this limitation because it teaches the use of "two sets of mutually isolated common connect wires φ_{SAP} and φ_{SAN}, called 'voltage source lines,' that receive supply voltages." (Samsung Br. at 13). Samsung contends that these lines form a mesh by extending in a two-dimensional arrangement throughout the memory array region. (*Id.*). MEI disagrees. Relying on the Taylor certification, MEI argues that the φ_{SAP} and φ_{SAN} lines are not voltage supply lines as Samsung contends. Instead, they are signal lines. (Taylor Cert. ¶¶ 095-9 to 095-14). Taylor explains that the φ_{SAP} and φ_{SAN} signals are signals which the drivers provide, rather than the first and second supply voltages which are provided to the sense amplifier drive circuits. (*Id.* ¶ 095-12). Again, the Court concludes that this limitation presents a disputed factual issue that must be resolved by the factfinder. Accordingly, summary judgment is denied.

ii. The Childers Reference

Samsung also moves for summary judgment that the Childers patent anticipates Claim 1 of the '095 Patent. This patent was filed on November 1, 1988. Thus, Samsung asserts that this is prior art under § 102(b). Samsung argues that each and every limitation of Claim 1 is disclosed in the Childers reference.

In response, MEI contends that the Childers patent does not anticipate because it too fails to

disclose a "plurality of sense amplifier drive circuits" as required by the claim. (Taylor Cert. ¶ 095-29). MEI argues that Samsung mistakenly relies on a single quote from the Childers patent to indicate that a plurality of sense amplifier drive circuits drive the sense amplifier circuits. According to MEI, only a single sense amplifier driver may provide voltage to the sense amplifier. (*Id.* ¶ 095-30). MEI contends that this is the arrangement disclosed in the White patent, a cited reference in the Childers patent. (*Id.* ¶ 095-31). Additionally, MEI argues that contrary to Samsung's assertion, the White patent does not disclose voltage supply meshes. Rather, that reference discloses an NMOS device which varies significantly from the CMOS devices disclosed in the '095 Patent.

In light of the competing expert opinions concerning whether the Childers patent alone, or in combination with the White patent, discloses each and every limitation of the claims of the '095 Patent, the Court concludes that Samsung's motion for summary judgment of invalidity must be denied.

b. Obviousness

Alternatively, Samsung moves for summary judgment that Claims 2 and 3 of the '095 Patent are obvious in light of the Hara and Hitachi references. Additionally, Samsung moves for summary judgment that Claim 1 of the '095 Patent is obvious, and thus invalid, in light of the Childers reference and other prior art references. The Patent Act provides that:

> A patent may not be obtained . . . if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

35 U.S.C. § 103(a); *Graham v. John Deere Co.*, 383 U.S. 1, 13-14 (1966). A finding of obviousness

is a legal determination based upon factual inquiries. *Rockwell Int'l Corp. v. United States*, 147 F.3d 1358, 1362 (Fed. Cir.1998). Such inquiries include determinations concerning: 1) the "scope and content of the prior art"; 2) "differences between the prior art and the claims at issue"; 3) "the level of ordinary skill in the pertinent art"; and 4) secondary considerations such as long-felt need, commercial success, and failure of others. *Graham*, 383 U.S. at 17-18. A district court cannot make a proper obviousness determination without analyzing these factors. *Greenwood v. Hattori Seiko Co., Ltd.*, 900 F.2d 238, 241 (Fed. Cir. 1990) ("Since the proper Graham analysis was not made by the district court, the summary judgment of obviousness under 35 U.S.C. § 103 must be vacated."). In light of the presumption that patents are valid, an alleged infringer must prove obviousness by clear and convincing evidence. *Kao Corp. v. Unilever U.S., Inc.*, 441 F.3d 963 (Fed. Cir. 2006).

In the present case, Samsung fails to adequately address these factors in its brief. Samsung only mentions in a conclusory manner that a person of ordinary skill in the art would have been motivated to combine certain references. Particularly, Samsung asserts that "a person of ordinary skill in the art, would appreciate that the first part and the second part of the Hara reference's wire meshes are on different layers of the memory device" since this was well known in the art. (Samsung's Br. at 19). Samsung also states that the Hara reference, in combination with the 1987 Hitachi publication, would motivate one skilled in the art to use through-hole connections with a two wire layout to improve the wiring.

With regard to Childers, Samsung's entire obviousness argument essentially consists of the following statement: "[A] person would be motivated to include driver circuits to drive the sense amplifiers because the Childers patent instructs such a person to do so, and because it was well known at the time that such circuits are necessary to operate the sense amplifiers that the Childers

patent discloses." (Samsung's Br. at 28).

This is clearly insufficient to support a finding that Claims 1 to 3 of the '095 Patent are invalid as obvious, particularly in light of the high burden of proof an alleged infringer must satisfy before such a conclusion can be made. Consequently, Samsung's motion for summary judgment that Claims 1 to 3 of the '095 Patent are invalid as obvious is denied.

2. Invalidity of the '998 Patent

Samsung moves for summary judgment that the asserted claims of the '998 Patent, namely Claims 1, 2, 4, 5, 7 and 8, are invalid as anticipated by Samsung's own patent, U.S. Patent No. 4,948,993 ("the '993 Patent"). To succeed on this claim, Samsung must establish that each and every element of the claimed invention is disclosed in this one prior art reference. *In re Paulsen*, 30 F.3d 1475, 1478-79 (Fed. Cir. 1994). Thus, summary judgment must be denied if Samsung fails to prove at least one element is disclosed in the prior art reference or if MEI adduces evidence which raises a genuine factual issue as to any of the claimed elements.

Claim 1 of the '998 Patent, a representative claim, states:

> 1. A semiconductor memory device comprising:
>
> a memory cell array having a plurality of memory cells arranged in the form of a matrix;
>
> a *means for reading* into a plurality of data lines data from a plurality of memory cells connected to a specific word line by activating said specific word line of said memory cell array;
>
> a sense amplifier consisting of a plurality of differential amplifiers connected to said plurality of data lines respectively for amplifying the data read into said plurality of data lines;
>
> first and second *sense amplifier drivers* connected to the opposite

> ends of a *restore signal line and a drive signal line* respectively which are in turn connected to said plurality of differential amplifiers of said sense amplifiers, and
>
> a delay means for giving a time difference to an operation start timing of said first and second sense amplifier drivers.

'998 Patent, Claim 1 (emphases added).

As a preliminary matter, the Court must clarify one aspect of its *Markman* ruling which appears to be critical in determining the validity of the '998 Patent. This concerns the "one-to-one correspondence" issue.[13] This became an issue with regard to the construction for the claim terms "restore signal line," "drive signal line," and "sense amplifier driver." In its claim construction analysis, the Court noted that the patentees differentiated between the terms "sense amplifier" and "differential amplifiers." Based on this observation and the plain language of the claims, the Court made the following conclusions: 1) Claim 1 of the '998 Patent requires at least one sense amplifier; 2) each sense amplifier consists of a plurality, or at least two, differential amplifiers; 3) the claims also requires a first and second sense amplifier driver connected to opposite ends of a restore signal line and drive signal line; and 4) the restore and drive signal lines are connected to the plurality of differential amplifiers contained within the sense amplifiers. (*Markman* Op. at 17-23). In essence, the Court concluded that Claim 1 of the '998 Patent excluded an arrangement where a sense amplifier driver was connected to restore and drive signal lines that provided voltages for only one

[13] In a letter submitted by Samsung dated March 16, 2005, Samsung informed the Court of an inconsistency in the use of the term "one-to-one correspondence" by the parties and further alerted the Court to potential ambiguities likely to arise with respect to the validity of the '998 Patent as a result of this. In light of these potential ambiguities relating to the use of this phrase, the Court chooses to abandon the use of the phrase altogether and instead refer to the specific terms appearing in the patent's claims.

differential amplifier.[14]

With this clarification as a backdrop, the Court will now address Samsung's invalidity argument. Samsung contends that the '993 Patent discloses each and every element of the claim. In response, MEI asserts that the '993 Patent fails to disclose at least three elements, and therefore cannot anticipate the claims of the patent. In particular, MEI argues that the '993 Patent does not disclose: 1) a "means for reading"; 2) "restore/drive signal lines"; and 3) "sense amplifier drivers."

First, MEI claims that the '993 Patent does not disclose a "means for reading" as required by all of the asserted claims. The Court concluded that "means for reading" is a means-plus-function limitation. The claimed function is "to read data from a plurality of the memory cells connected to a specific word line into a plurality of data lines by activating the specific word line of the memory cell array," and the corresponding structure is the word line driver 3 and memory cells 13 (*Markman* Order at 1-2). Samsung claims that the '993 Patent includes this limitation because it discloses "an integrated memory device and such devices all have memory cells selected by driving word lines with word line drivers." (Samsung Am. Reply at 14 (citing Declaration of McAlexander ("McAlexander Decl.") ¶ 76); Samsung Br. at 33). Relying on the declaration of Hwang, Samsung asserts that a person of ordinary skill in the art would understand that the word lines are driven by the word line drivers in the '993 Patent. (Hwang Decl. ¶¶ 24-25).

MEI, however, claims that the '993 Patent fails to disclose a word line driver. In support of this position, MEI cites the Taylor certification which states: "The '993 patent does not disclose a

[14] Despite Samsung's disagreement, this is an arrangement that would be covered by Samsung's proposed claim construction for "sense amplifier driver" – namely, "a circuit connected to the restore signal line and the drive signal line that provides voltages for operating *one* or more differential amplifiers." (Joint Claim Construction Chart at 2) (emphasis added).

word line driver, nor does Samsung identify such a structure in its motion." (Taylor Cert. ¶ 998-3). The Court finds this conclusory statement by Taylor insufficient to create a genuine issue of fact. Consequently, in light of the evidence of record, the Court rejects MEI's argument and grants summary judgment that the '993 Patent discloses the "means for reading" element of the '998 Patent.

MEI next argues that summary judgment must be denied because the '993 Patent fails to disclose the "restore/drive signal lines" and "sense amplifier driver" limitations which are required by all claims in the '998 Patent. As aforementioned, the Court construed "restore signal line" as "a line that is connected to both the sense amplifier driver and the differential amplifier through which an electric current, namely a restore signal, flows which causes the differential amplifiers to operate." (*Markman* Order at 2). The Court also construed "drive signal line" as "a line that is connected to both the sense amplifier driver and the differential amplifier through which an electric current, namely a drive signal, flows which causes the differential amplifiers to operate." (*Id.*).

MEI argues that the lines which Samsung identifies as the restore and drive signal lines, namely the lines labeled S and S* in Figure 2 of the '993 Patent, are not the claimed restore and drive signal lines. Although not entirely clear, MEI characterizes at least part of these lines as "precharge lines" and contends that these lines fail to meet the claim limitation of "restore/drive signal lines" because current does not flow through these lines during the sensing operation. MEI introduces evidence that the precharge lines of Figure 2 are not necessary to turn on the differential amplifiers. (Solomita Supp. Cert., Ex. 1 at 132-37; Taylor Supp. Cert. ¶ 13). Thus, MEI asserts that the "precharge lines" are not "restore/drive signal lines" if there is no electric current flowing through these lines which causes the differential amplifiers to operate. (Taylor Cert. ¶¶ 998-06 to 998-08).

In line with this argument, MEI also contends that the '993 Patent does not disclose sense amplifier drivers since the precharge lines are not restore/drive signal lines and thus fail to connect the sense amplifier driver to a plurality of differential amplifiers. (Taylor Cert. ¶ 998-10).

In response, Samsung argues that it adduced incontrovertible evidence establishing that voltages on the conductor lines S and S* cause the operation of the differential amplifiers. (McAlexander Decl. ¶¶ 77, 80-81; Hwang Decl. ¶¶ 5-9). Samsung asserts that the relevant inquiry before the Court is "whether the *sense amplifier drivers*, not the precharge circuit, provide operating voltages on the S and S* lines." (Samsung Reply at 16) (emphasis in original).

The relevant inquiry this Court must make is whether the conductor lines in the '993 Patent meet the definition of the restore and drive signal lines as construed by this Court. Based on the competing evidence in the record, the Court concludes that this is a disputed factual issue that must be resolved by the factfinder at trial. Accordingly, summary judgment is not warranted. The Court therefore denies Samsung's motion for summary judgment that the '993 Patent invalidates Claims 1, 2, 4, 5, 7 and 8 of the '998 Patent on grounds of anticipation, but grants summary judgment that the '993 Patent discloses a "means for reading."

3. Noninfringement of the'648 Patent

Samsung moves for summary judgment that their DRAMs do not infringe Claims 1 and 4 of the '648 Patent as applied to Embodiment II.[15] Claims 1 and 4 of the '648 Patent require

[15] MEI does not oppose Samsung's motion for summary judgment that Samsung's DRAMs do not infringe the '648 Patent as applied to Embodiments I, III, and IV. (Tr. of Oral Arg. at 149:25-150:4). Therefore, the Court grants summary judgment of noninfringement as to these Embodiments.

"memory replacement means." The Court concluded that the corresponding structures for the "memory replacement means" in Claims 1 and 4 as disclosed in Embodiment II is the redundancy-use decision circuit 20, the redundancy encoder 8, the circuit for generating the primary memory stop signal 18, and the memory cell block selection switching circuit 29 in Figure 6. (*Markman* Order at 13).

Samsung asserts that its products do not read on the "memory replacement means" limitation because they do not include a redundancy encoder 8 as required by the claims. Rather, Samsung contends that its products use a prior art method for selecting spare word lines. This method skips the step of encoding signals into a compressed spare address and sends redundancy use signals directly to row decoders. (Samsung Br. at 46). According to Samsung, its products do not include the intermediate circuitry involved in providing the encoded spare word line to the row decoder, and thus cannot infringe the '648 Patent. (Hoffman Decl. ¶¶ 16-20).

MEI responds by asserting that Samsung's DRAM devices do in fact include redundancy encoders. According to MEI, Samsung's DRAMs include circuits that use fuses, logic circuitry, or a specified wire configuration to act as a redundancy encoder. (Taylor Cert. ¶¶ 648-8 to 648-38). In support of this position, MEI relies on the Taylor certification. With respect to Samsung's SDRAM devices, Taylor opines that these devices utilize a redundancy scheme involving a circuit with several fuses which perform the function of storing addresses of defective memory cells. In addition to these fuses, these accused products also employ logic circuitry. Taylor opines that these two elements form the Redundancy Encoder. (*Id.* ¶ 648-13). Taylor offers similar positions with regard to the remaining accused devices. (*Id.* ¶¶ 648-19 to 648-38).

In reply, Samsung asserts that MEI's argument fails to create a genuine issue of fact because

this is a newly crafted argument that directly contradicts MEI's outstanding interrogatory response. Citing *Martin v. Merrell Dow Pharma.*, 851 F.3d 703 (3d Cir. 1988), Samsung asserts that MEI cannot change its position in an effort to stave off summary judgment. MEI counters by asserting that it had no choice but to revise its position as a result of Samsung's action – specifically, Samsung's purported refusal to provide discovery that would have allowed MEI to formulate these positions earlier.

In light of this record, the Court concludes that summary judgment of noninfringement is not proper at this stage. The record is replete with disputed fact issues – not only with respect to the redundancy encoder issue, but with regard to the arguments advanced in MEI's opposition. Drawing all reasonable inferences in favor of MEI as the nonmoving party, the Court must deny Samsung's motion for summary judgment that its devices do not infringe the '648 Patent with respect to Embodiment II.

4. Infringement of the '048 Patent by MEI's 0.25 eDRAM Products

Samsung argues that MEI's 0.25 μm eDRAM products literally infringe Claims 1 and 2 of the '048 Patent. Claims 1 and 2 claim a semiconductor device with a particular gate structure. These claims recite:

> 1. A semiconductor device with a gate structure, said semiconductor device comprising:
>
> a gate insulating layer formed on a semiconductor substrate;
>
> a gate structure having a first conductive layer of polycrystalline silicon and a second conductive layer of refractory metal silicide, said first conductive layer being formed on said gate insulating layer and said second conductive layer being formed on said first conductive layer, said second conductive layer having a *recessed edge portion*

> with respect to an edge portion of said first conductive layer; and
>
> a first insulating layer formed on a top surface of said second conductive layer and having a *protrusion portion* with respect to an edge of said second conductive layer.
>
> 2. A semiconductor device according to claim 1, further comprising a source region and a drain region adjacent to said gate structure, and a *second insulating layer* formed on at least part of said first insulating layer, on said edge portion of said recessed second conductive layer and on said edge portions of said first conductive layer and said first insulating layer.

'048 Patent, Claims 1 & 2 (emphases added). Samsung contends that MEI has already admitted that its products include all the limitations of Claims 1 and 2, with the exception of three limitations. MEI does not oppose this. Accordingly, the Court grants summary judgment that MEI's 0.25 μm eDRAM Products satisfy these particular claims limitations. MEI, however, contends that its products do not meet the following limitations: 1) "recessed edge portion"; 2) "protrusion portion"; and 3) "second insulating layer." (Samsung Br. at 62-64 (citing MEI's Resp. to Req. for Admis.)).

In support of its motion, Samsung relies on microphotographs of two MEI chips which, according to Samsung, establish that these claims limitations are indeed present in the accused products. Samsung argues that the photographs are consistent with MEI's process development reports which establish that their products consist of a "polysilicon layer (PS), a tungsten silicide layer (WSi) with a recessed edge portion, a first insulating layer (TEOS) with a protrusion portion, and a second insulating layer covering the various edge portions of Claim 2." (Samsung's Br. at 69; Hess Decl. ¶ 14).

MEI advances two arguments in response to Samsung's assertion that the MEI products include the "recessed edge portion" and the "protrusion portion." First, MEI argues that two processes are used to form the accused products. MEI asserts that these processes use a dry-etching

step to etch the three layers that comprise the gate structure. Relying on the deposition testimony of Kazuhiro Nishimura ("Nishimura"), MEI's corporate representative, MEI claims that "the dry-etching step etches the layers so that the widths of all three layers are the same." (MEI Opp'n at 62 (citing Tr. of Nishimura Dep. at 190:8-13)). As an example. MEI asserts that one of the processes etch the WSi and PS layer to an approximate width of 0.27 μm.

The Court finds this argument unavailing for two reasons. First, the deposition testimony upon which MEI cites in support of its position does not actually support it. The cited excerpt discusses the cleaning step of the processes as opposed to the resulting widths of the layer. Second, MEI's argument is based on the inaccurate assumption that its products cannot have a "recessed edge portion" or a "protrusion portion" since the wet-etching step or a comparable etching step is not used. Though the '048 Patent teaches the use of a wet-etching step, this is not required by the claim. Instead, the claim requires the presence of a "recessed edge portion" and a "protrusion portion" regardless of how these structural features came about. Consequently, this argument is rejected.

MEI next argues that the microphotographs submitted by Samsung fail to establish the presence of the elements. MEI characterizes the photographs as unreliable since Samsung failed to provide detailed information regarding how the photos were obtained, including the chemicals or procedures used. MEI further argues that the photographs contain inaccurate representations of the device because they fail to clearly depict the edges of various layers. (Noble Cert. ¶¶ 048-23 to 048-25).

Drawing all reasonable inferences in favor of MEI, the Court concludes that summary judgment on this issue cannot be granted at this time. An interpretation of the microphotographs is a task best left to the factfinder at trial. Although Samsung contends that a determination of where

the edges are positioned in the photographs is one that may be decided as a matter of law, the Court disagrees. Moreover, MEI submits the opinion of its expert who renders a different interpretation of the photograph. *Id.* Consequently, the Court concludes that there are genuine issues of material fact as to whether the products satisfy the "recessed edge portion" and "protrusion potion."

With respect to the limitation "second insulating layer," the Court concludes that issues of fact preclude entry of summary judgment that this limitation is present in the accused products as well. For example, the Court finds issues of fact concerning whether the "NSG layer" is the "second insulating layer" and, if so, whether Samsung established that this layer is found in the accused products. Although Samsung argues in its reply brief that it identified the NSG layer as the second insulating layer all along, the manner in which Samsung labeled the photographs in its initial moving brief does not clearly reflect this. For example, based on the labels appearing in the photographs on page 67 of its moving brief, it is unclear as to what Samsung identifies as the "second insulating layer." Moreover, Samsung did not state in its moving brief that the "second insulating layer" is indeed the NSG layer which MEI mentions in its opposition. Therefore, in light of the reasonable inferences that must be drawn in favor of MEI, the Court denies summary judgment that the products include a "second insulating layer."

Accordingly, Samsung's motion for summary judgment that MEI's products infringe the '048 Patent is denied in part. The Court denies summary judgment that the accused products read on the "recessed edge portion," "protrusion portion," and "second insulating layer" elements of the claim. The Court grants summary judgment that the MEI products satisfy the remaining claim limitations of Claims 1 and 2.

V. CONCLUSION

For the reasons set forth above, the parties' motions for summary judgment are granted-in-part and denied-in-part. An appropriate form of Order accompanies this Memorandum Opinion.

Dated: June 26, 2006

s/ Garrett E. Brown, Jr.
GARRETT E. BROWN, JR., U.S.D.J.